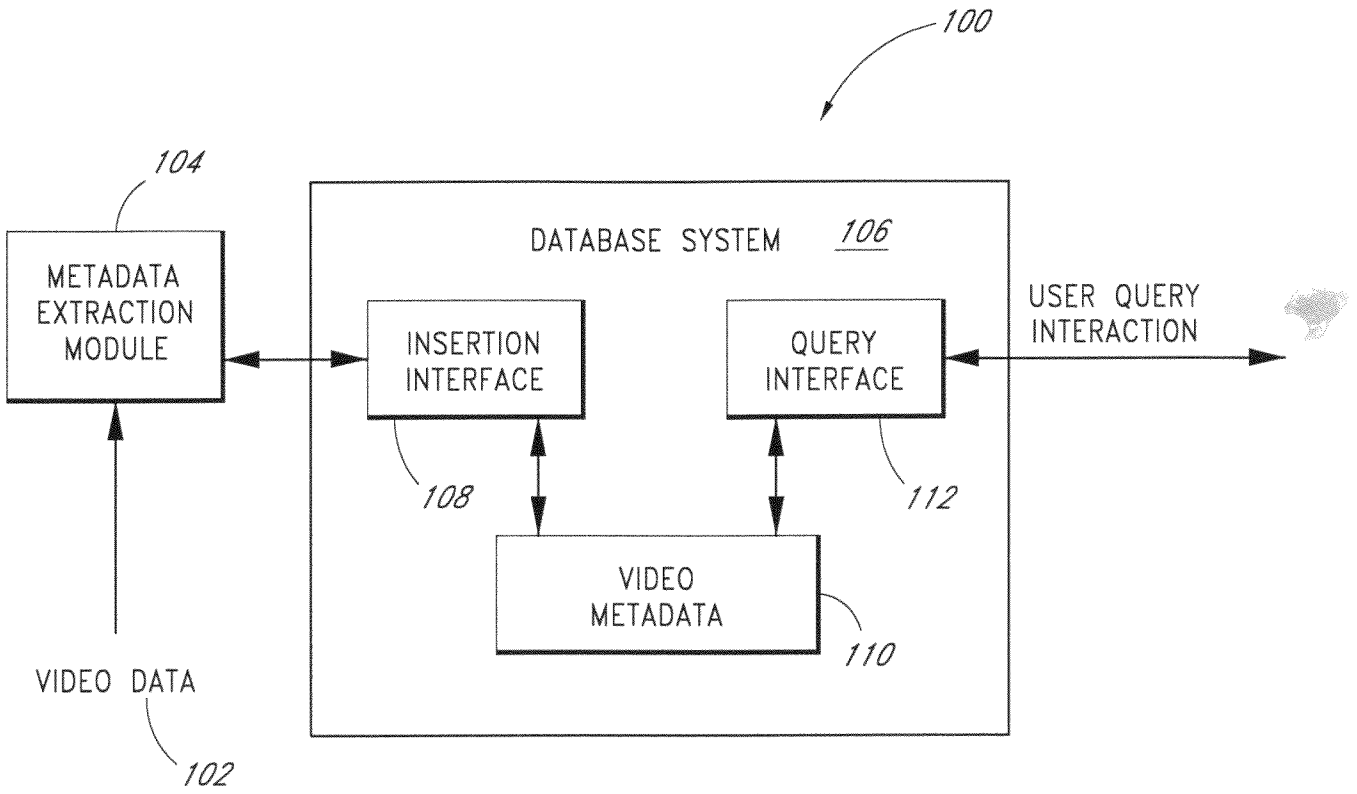
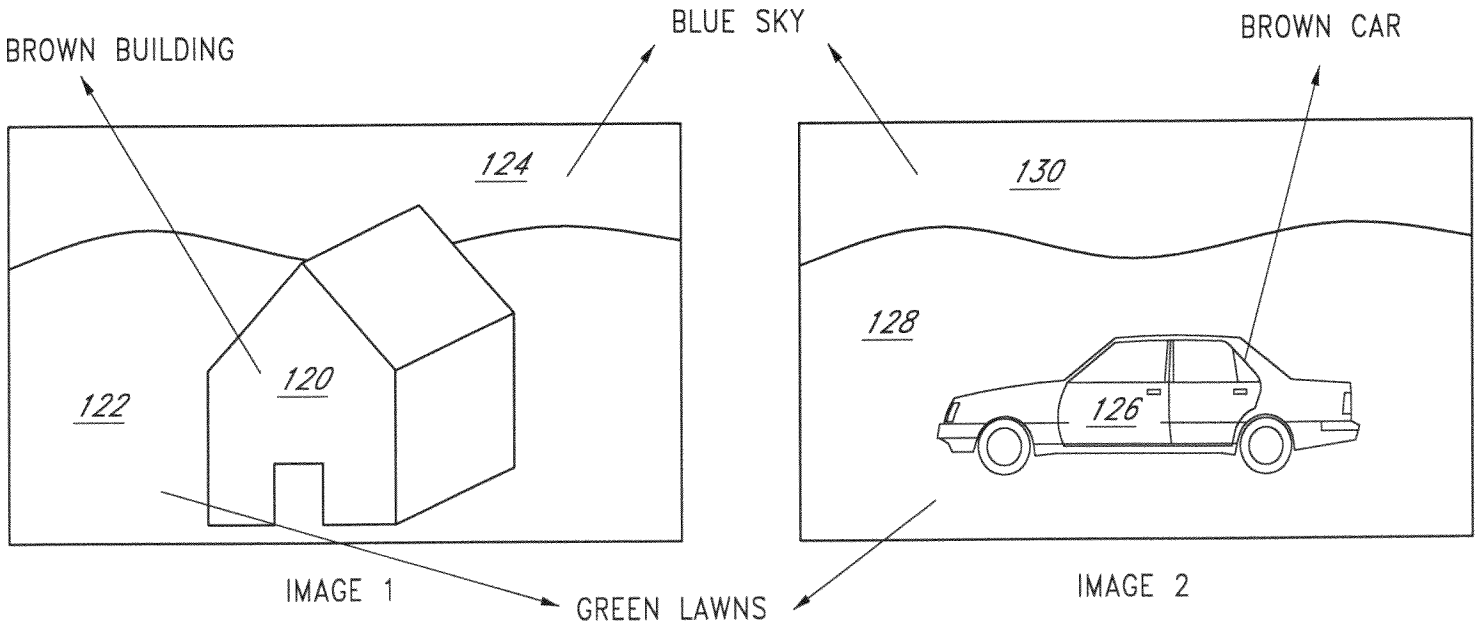

100
104
METADATA EXTRACTION MODULE
DATABASE SYSTEM 106
INSERTION INTERFACE
QUERY INTERFACE
USER QUERY INTERACTION
108
112
VIDEO METADATA
110
VIDEO DATA
102
A VIDEO DATABASE SYSTEM

FIG. 1



EXAMPLES TO ILLUSTRATE THE CHROMATIC AND STRUCTURAL PROPERTIES OF IMAGES

FIG.2

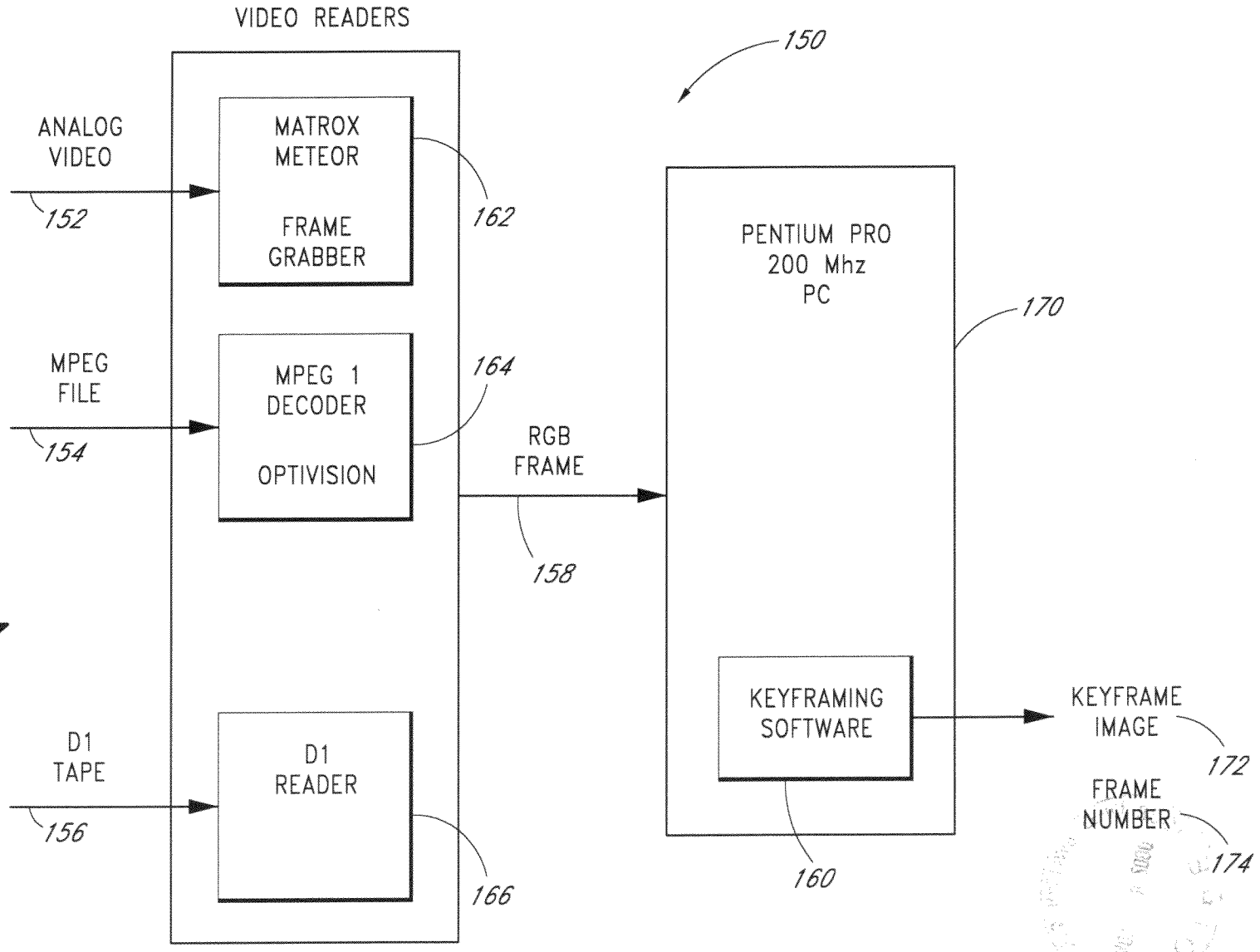


FIG. 3

THE KEYFRAMING SYSTEM

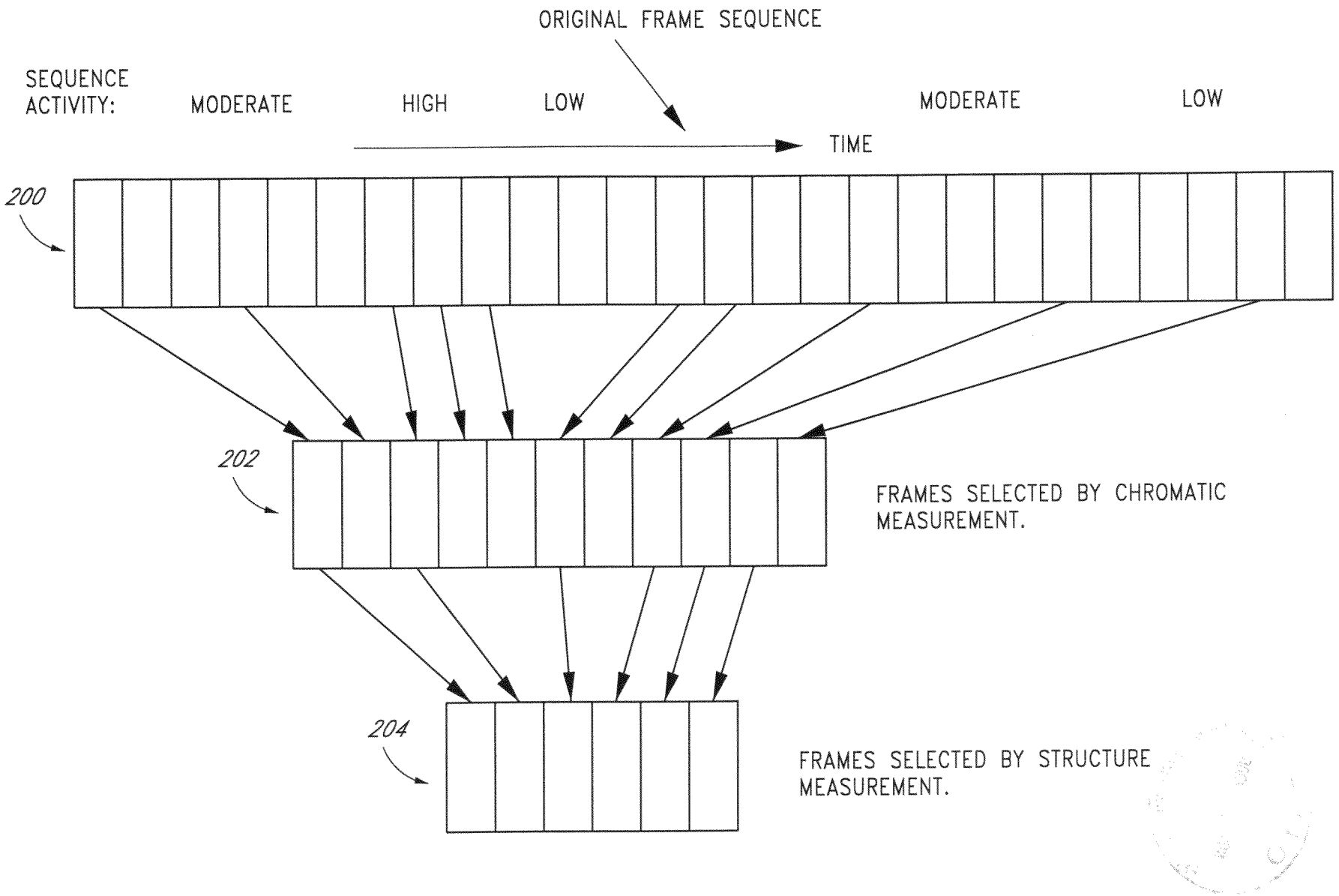

ORIGINAL FRAME SEQUENCE
SEQUENCE ACTIVITY:
MODERATE
HIGH
LOW
MODERATE
LOW
TIME
200
202
FRAMES SELECTED BY CHROMATIC MEASUREMENT.
204
FRAMES SELECTED BY STRUCTURE MEASUREMENT.

FIG. 4

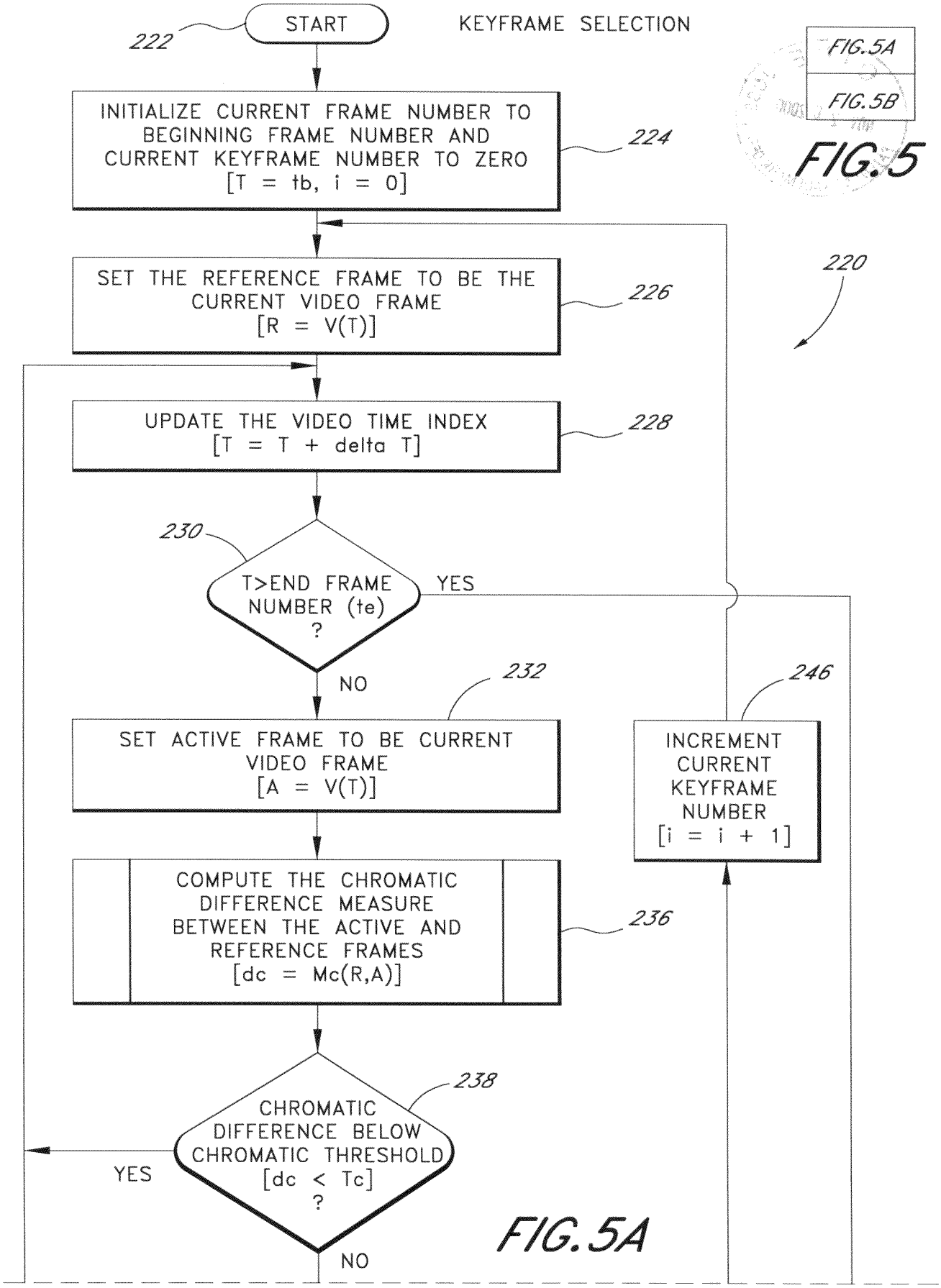

KEYFRAME SELECTION
222
START
INITIALIZE CURRENT FRAME NUMBER TO BEGINNING FRAME NUMBER AND CURRENT KEYFRAME NUMBER TO ZERO [T = tb, i = 0]
224
SET THE REFERENCE FRAME TO BE THE CURRENT VIDEO FRAME [R = V(T)]
226
220
UPDATE THE VIDEO TIME INDEX [T = T + delta T]
228
230
T>END FRAME NUMBER (te) ?
YES
NO
232
SET ACTIVE FRAME TO BE CURRENT VIDEO FRAME [A = V(T)]
246
INCREMENT CURRENT KEYFRAME NUMBER [i = i + 1]
COMPUTE THE CHROMATIC DIFFERENCE MEASURE BETWEEN THE ACTIVE AND REFERENCE FRAMES [dc = Mc(R,A)]
236
238
CHROMATIC DIFFERENCE BELOW CHROMATIC THRESHOLD [dc < Tc] ?
YES
NO

FIG. 5A

FIG.5A
FIG.5B

FIG. 5

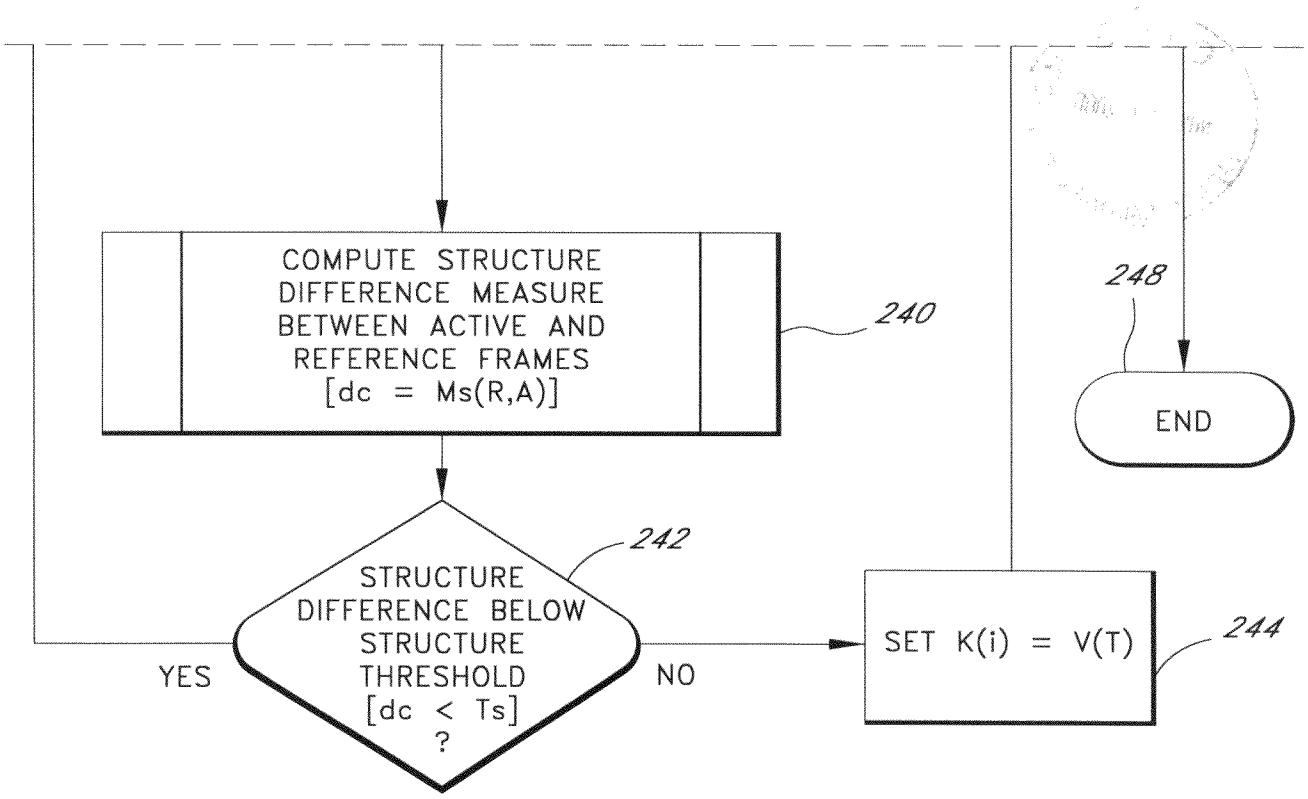

COMPUTE STRUCTURE DIFFERENCE MEASURE BETWEEN ACTIVE AND REFERENCE FRAMES [dc = Ms(R,A)]
240
248
END
242
STRUCTURE DIFFERENCE BELOW STRUCTURE THRESHOLD [dc < Ts] ?
YES
NO
SET K(i) = V(T)
244

FIG. 5B

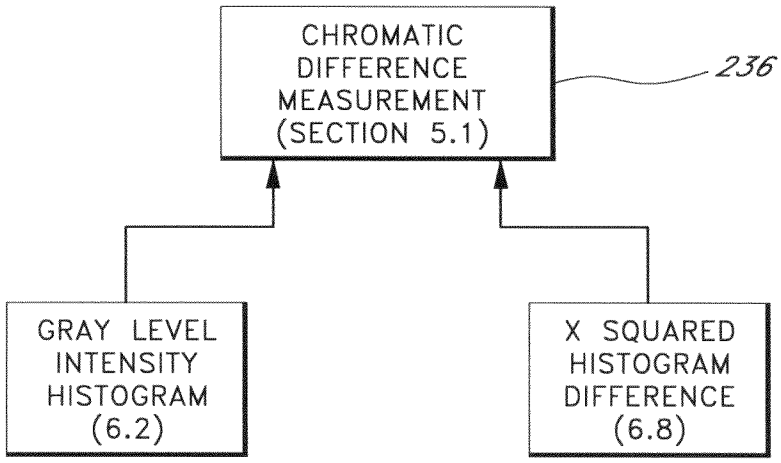

CHROMATIC DIFFERENCE MEASUREMENT (SECTION 5.1)
236
GRAY LEVEL INTENSITY HISTOGRAM (6.2)
X SQUARED HISTOGRAM DIFFERENCE (6.8)

FIG. 6

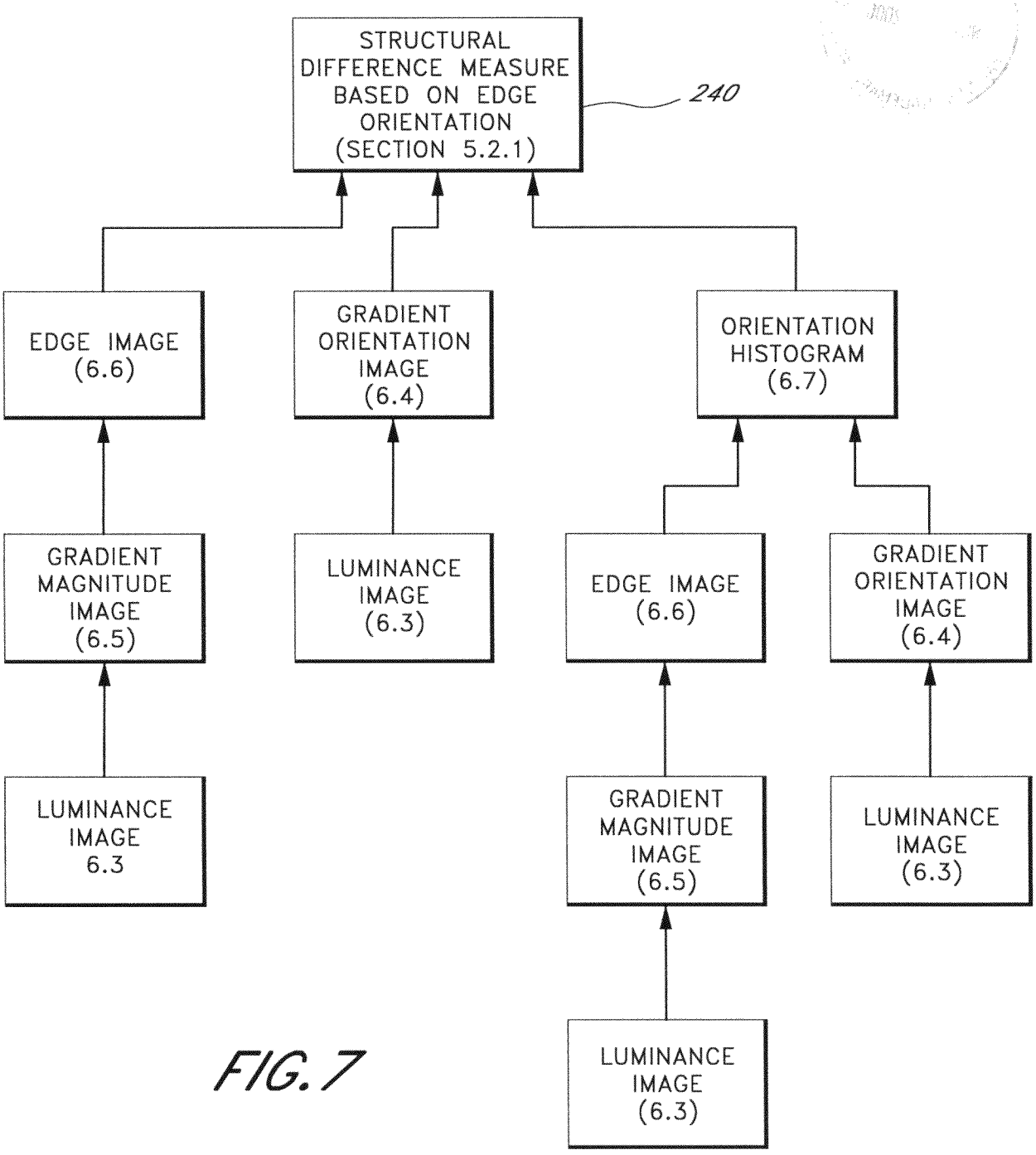

STRUCTURAL DIFFERENCE MEASURE BASED ON EDGE ORIENTATION (SECTION 5.2.1)
240
EDGE IMAGE (6.6)
GRADIENT ORIENTATION IMAGE (6.4)
ORIENTATION HISTOGRAM (6.7)
GRADIENT MAGNITUDE IMAGE (6.5)
LUMINANCE IMAGE (6.3)
EDGE IMAGE (6.6)
GRADIENT ORIENTATION IMAGE (6.4)
LUMINANCE IMAGE 6.3
GRADIENT MAGNITUDE IMAGE (6.5)
LUMINANCE IMAGE (6.3)
LUMINANCE IMAGE (6.3)

FIG. 7

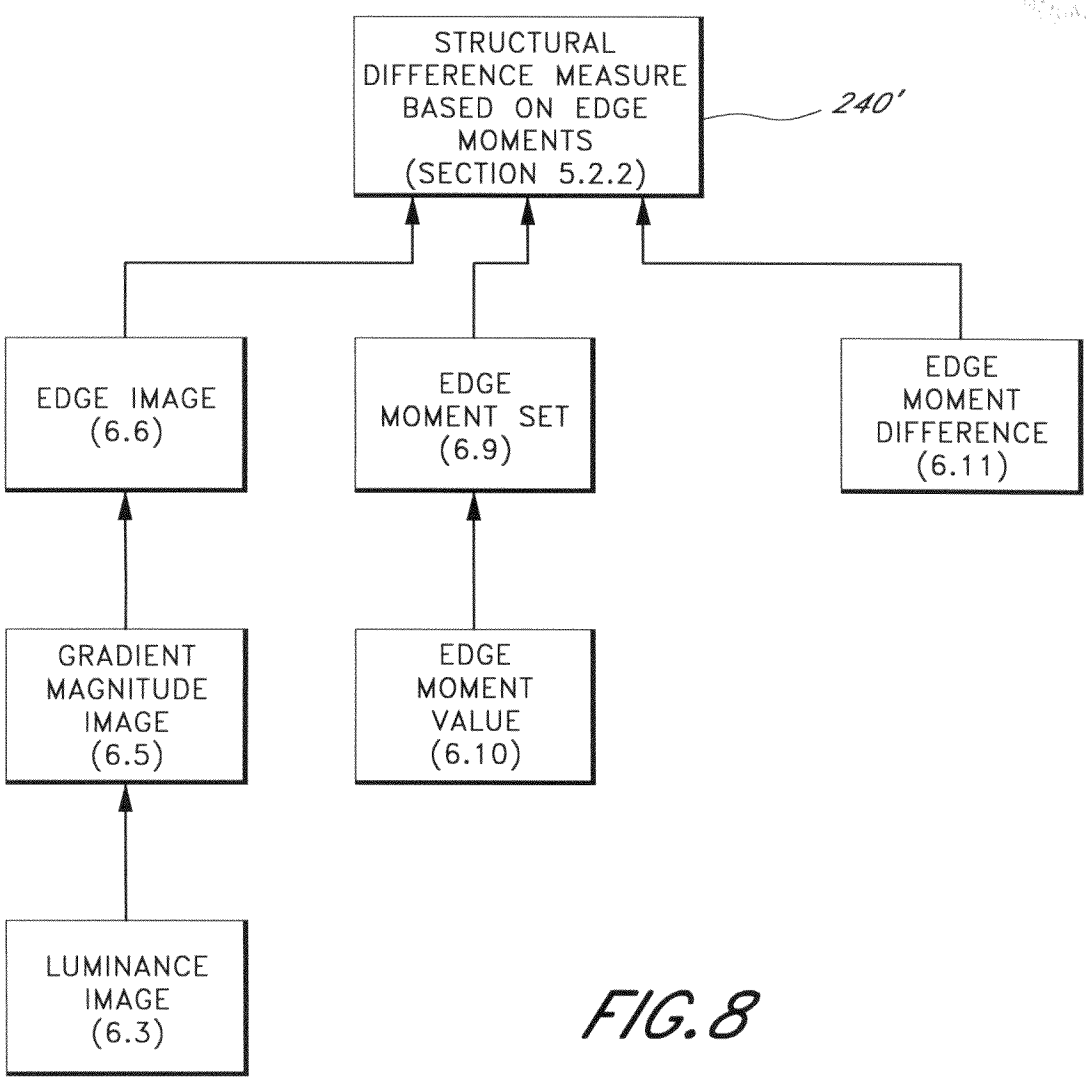
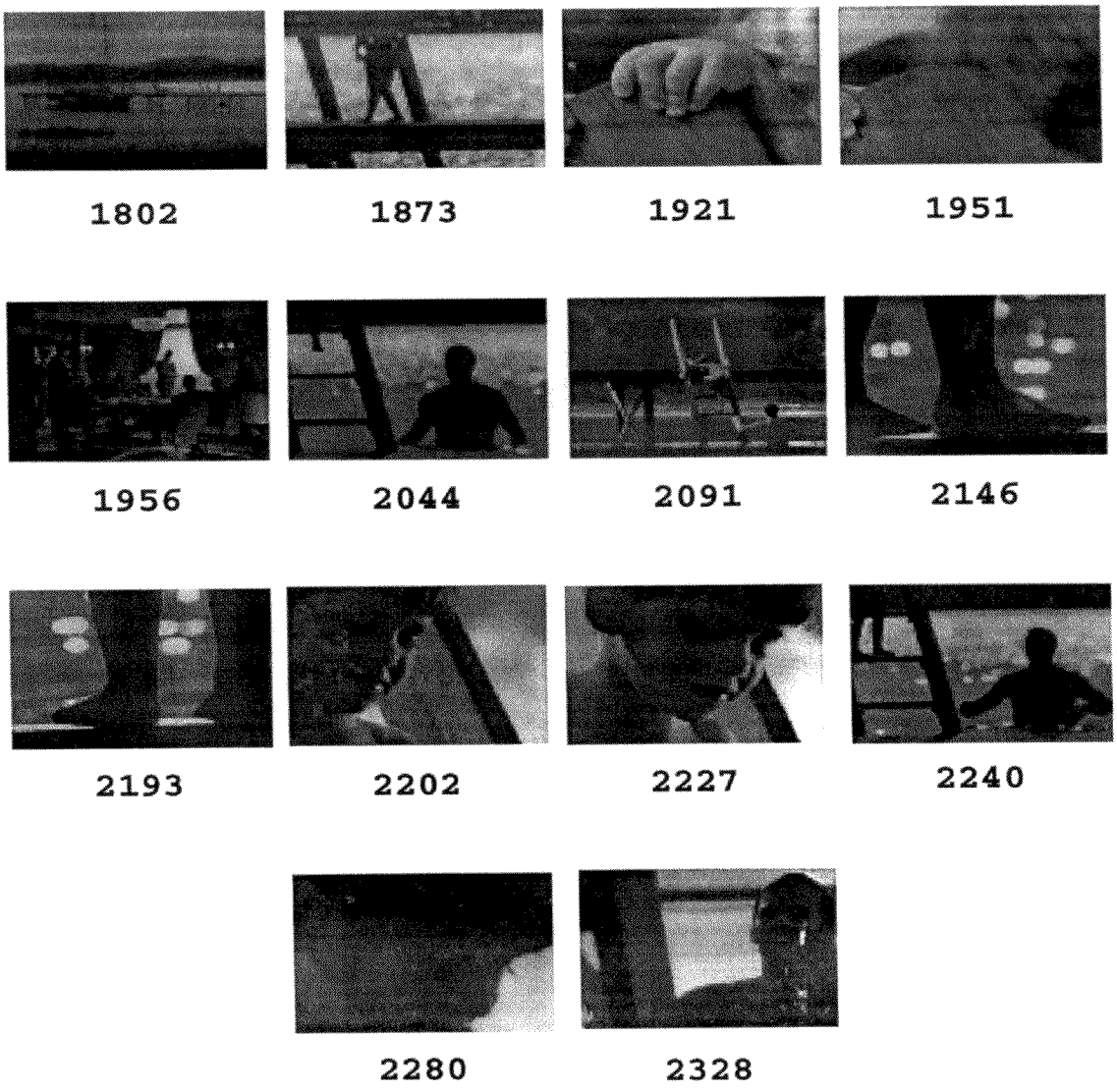

STRUCTURAL DIFFERENCE MEASURE BASED ON EDGE MOMENTS (SECTION 5.2.2)
240'
EDGE IMAGE (6.6)
EDGE MOMENT SET (6.9)
EDGE MOMENT DIFFERENCE (6.11)
GRADIENT MAGNITUDE IMAGE (6.5)
EDGE MOMENT VALUE (6.10)
LUMINANCE IMAGE (6.3)

FIG. 8

Output of Stage 1: Chromatic Difference

The Results of Applying the invention to 600 frames of a Video sequence

FIG.9



Output of Stage 2: Structural Difference

The Results of Applying the invention to 600 frames of a Video sequence

FIG.10